Appendix I: Transportation and Land Use - detailed policy description/analysis

Overview

The Transportation and Land Use sector includes GHG mitigation opportunities related to vehicle technologies, fuel choices, transit options, and demand for transportation services. The CCAG recommends a set of 13 policy options for the TLU sector that offer the potential for major GHG emissions reductions from the reference projection. As summarized in the table below, these 13 policy recommendations could lead to emissions savings from reference case projections of 14.5 $MMtCO_2e$ per year by 2020 and cumulative savings of 91 $MMtCO_2e$ from 2007 through 2020. The weighted average cost of saved carbon from the policy options for which quantitative estimates of both costs and savings were prepared was minus $32 per metric ton of CO_2 equivalent, meaning that there is a net savings to the Arizona economy in implementing these options.

For each recommended TLU policy, this technical appendix provides details on design, analysis, quantification of impacts, and other related information. (See Appendix E for explanation of the general methods applied.) When these TLU policies were quantified, some policies were considered to have overlapping impact. To avoid double-counting of GHG emission reductions, the following steps were taken:

- Light-duty sector: Implementation of the light-duty measures would cause overlap with each other. For example, the State Clean Car Program (TLU-1) reduces per-vehicle CO_2 emissions while the Smart Growth Bundle (TLU-2) reduces the overall Vehicle-miles Traveled (VMT) from the light-duty sector. Thus, the VMT that should be applied to TLU-1 is reduced by TLU-2 while the per-mile CO_2 reduction for TLU-2 would be reduced by TLU-1. The sum of the product of the fraction of emissions remaining after each individual measure (TLU-1, TLU-2, TLU-9, and TLU-10) was applied to the reference case projected emissions showed the total fraction of the reference case emissions that would be expected to remain with these four measures applied in combination. In 2020, these four measures provide a total reduction to the light-duty CO_2 emissions of 37% when applied individually. When applied in combination and accounting for the overlap, they reduce 2020 reference case projected light-duty CO_2 emissions by 33%.
- Freight sector: Implementation of the biodiesel option (TLU-12) would overlap with the idling reduction option (TLU-4) and the reduced speed limit for commercial vehicles option (TLU-14). It was assumed that a portion of the fuel conserved in TLU-4 and TLU-14 would be biodiesel fuel, in the same proportion as described in the biodiesel option; e.g., 1.5% of the fuel conserved through 2014 and 10% of the fuel conserved from 2015 through 2020 (in terms of B100). Since a 78% reduction in CO_2 emissions was already applied to these fuel quantities in the biodiesel option, the base CO_2 emissions from these fuel quantities were reduced by an additional 22% rather than the complete 100% reduction (as applied to the diesel portion of the fuel) from conserving these fuel quantities in TLU-4 and TLU-14.

Transportation and Land Use Sector
Summary of Results

#	Policy Name	Estimated 2010 GHG Savings ($MMtCO_2e$)	Estimated 2020 GHG Savings ($MMtCO_2e$)	Estimated Costs or Cost Savings Per Ton ($\$/tCO_2e$)	Cumulative 2007–2020 GHG Savings ($MMtCO_2e$)	Level of CCAG Support
TLU-1	State Clean Car Program	0.3	5.6	-$90	32.5	Unanimous
TLU-2	Smart Growth Bundle	1.5	4.0	$0 (Net savings)	26.7	Unanimous
TLU-3	Promoting Multimodal Transit	Not available (included in TLU-2)				Unanimous
TLU-4	Reduction of Vehicle Idling	0.7	1.3	-$22	11.8	Unanimous
TLU-5	Standards for Alternative Fuels	Not available (enabling policy for TLU-12 and A-3)				Unanimous
TLU-7	Hybrid Promotion and Incentives	Not available (included in TLU-1)				Unanimous
TLU-8	Feebates	Not available				Super-majority
TLU-9	Pay-As-You-Drive Insurance	0	2.8	$0 (Zero Net cost)	12.3	Unanimous
TLU-10	Low Rolling Resistance Tires	0.0	0.8	Not available	4.8	Unanimous

TLU-11	Accelerated Replace-ment/ Retirement of High-emitting Diesel Fleet	0.2	0.03	Not available	1.2	Unanimous
TLU-12	Biodiesel Implemen-tation	0.1	1.1	$0 (Zero Net cost)	6.2	Unanimous
TLU-13	State Lead-By-Example (via Procure-ment and SmartWay)	0.03	0.04	$0 (Zero Net cost)	0.4	Unanimous
TLU-14	60 mph Speed Limit for Commercial Trucks	0.3	0.5	$35	5.2	Super-majority
Accounting for Policy Overlaps		-0.01	-1.5		-9.8	
Total All Options		**3.1**	**14.5**	**$ -32 (weighted average)**	***91.0***	

The savings in fuel, measured in barrels and dollars, associated with TLU policy recommendations are presented in the table below.

FUELS SAVINGS FROM TLU OPTIONS				
GASOLINE SAVINGS	**2010**	**2020**	**Cumulative Barrels**	**NPV (million $)**
Barrels of Gasoline Reduced	4,422,311	30,079,892	171,856,457	
Aggregate of TLU-1,3,9,10				
Gasoline Cost Savings (million $)	$393.8	$2,743.0		$9,647.3
Aggregate of TLU-1,3,9,10				
DIESEL SAVINGS	**2010**	**2020**	**Cumulative Barrels**	**NPV (million $)**
Barrels of Diesel Reduced				
TLU-4 Idling Reduction	1,728,519	3,102,881	29,617,707	
TLU-12 Biodiesel Implementation	335,603	3,213,032	20,086,318	
TLU-14 Reduced Speed Limit	808,463	1,161,024	12,258,875	
Total	2,872,585	7,476,936	61,962,900	
Diesel Cost Savings (million $)				
TLU-4 Idling Reduction	$174.2	$312.8		$2,068.0
TLU-12 Biodiesel Implementation	$0.0	$0.0		$0.0
TLU-14 Reduced Speed Limit	$81.5	$117.0		$871.2
Total	$255.7	$429.8		$2,939.2
TOTAL FUEL SAVINGS	**2010**	**2020**	**Cumulative Barrels**	**NPV (million $)**
Barrels of Fuel Reduced	7,294,895	37,556,828	233,819,357	
Fuel Cost Savings (million $)	$649.6	$3,172.8		$12,586.5

TLU-1 State Clean Car Program

Policy Description:

Adopt the "State Clean Car Program" (also known as the "Pavley" standards or "California GHG emission standards") in order to reduce the net emissions of GHGs from passenger vehicle operation.

Policy Design:

New cars and light trucks in all states must comply with Federal emission standards, and, generally speaking, states have the choice of adopting a stronger set of standards applicable in California. In 2005, California finalized a set of standards that would require reductions of GHG emissions of about 30% from new vehicles, phased in from 2009 to 2016, through a variety of means. The standards must still be approved by US EPA, and face a court challenge.

Implementation Method(s):

Standards take effect in Model Year 2011 (calendar year 2010).

Related Policies/Programs in Place:

Federal regulation of tailpipe emissions and fuel economy.

Types(s) of GHG Benefit(s):

Overwhelmingly CO_2 reductions.

Estimated GHG Savings and Costs per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0.3	5.6	$MMtCO_2e$
Net Present Value (2006–2020)		-$2,944	$million
Cumulative Emissions Reductions (2006–2020)		32.5	$MMtCO_2e$
Cost-Effectiveness		-90	$/$tCO_2e$

Data Sources, Methods, and Assumptions:

- **Data Sources:** Diane Brown and Elizabeth Ridlington, Cars and Global Warming: Policy Options to Reduce Arizona's Global Warming Pollution from Cars and Light Trucks, AZ PIRG Education Fund: February 2006, www.arizonapirg.org/AZ.asp?id2=22371 . CCS, Arizona Greenhouse Gas Inventory and Reference Case Projections, 1990–2020, March 2006.
- **Quantification Methods:** The AZ PIRG report used a model of light-duty vehicle fleet comparing the difference between base case emissions and emissions with fleet penetration over time of vehicles that meet lower GHG emissions standards consistent

with the California regulations. The AZ PIRG model calculated light-duty vehicle fuel use and emissions based upon scientifically valid methods. (See extended discussion in AZ PIRG report, pp. 22–26.)

CCS compared the AZ PIRG model results to results for the New England states and California that were obtained using comparable modeling methods. CCS found that while all three modeling efforts were scientifically valid and comparable, some of the AZ PIRG model assumptions and methods were relatively conservative, while the California and New England modeling results were relatively optimistic. CCS further refined the AZ PIRG model results consistent with a middle range scenario that produced results less conservative than the AZ PIRG results and less optimistic than the California and New England results. While AZ PIRG projected a 13.7% reduction in light duty vehicle emissions with this policy, the CCS refinement estimates a 15.5% reduction in emissions. CCS applied this refined percentage reduction in emissions to the CCAG approved reference case scenario to obtain a net estimated reduction of 5.6 $MMtCO_2e$ in 2020.

This analysis assumes the program will start with the 2011 model year. Some 2011 model year vehicles will be on the market in calendar year 2010, and so there are some small emissions reductions that are foreseeable for that first year of sales/implementation.

- Key Assumptions: The three modeling efforts have established a generally acceptable scientific method of projecting GHG emissions reductions from this policy. The CCS comparison of the three modeling methods provides some independent professional validation of the models and their results. The key assumption of the emissions reduction projected by CCS is that the most likely scenario for emissions reductions is one that would fall between the more conservative scenario projected by the AZ PIRG model and the more optimistic scenario projected by the California and the New England models.

Key Uncertainties:

Fleet turnover rates for light-duty vehicles and future patterns of consumer purchase choices between passenger cars and light-duty trucks (i.e., SUVs).

Ancillary Benefits and Costs, if applicable:

Some reduction in criteria pollutants is likely.

Feasibility Issues, if applicable:

Light-Duty Vehicle GHG emissions standards can be met with existing 'off-the-shelf' automotive technologies that are already in the marketplace.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-2 Smart Growth Bundle

Policy Description:

This bundle of options encompasses four components related to reducing GHG emissions through land use practices and policies. These policies contribute to GHG emission reductions by reducing vehicle trips and total vehicle miles traveled.

Policy Design:

Smart growth actions include the following programs and program elements:

- Infill and Brownfield redevelopment. Shifting housing and commercial development toward location efficient sites, such as infill and brownfields projects, and away from location inefficient sites, such as greenfields, reduces overall travel demand and expands lower emitting mode choices. Brownfields are commercial or industrial properties that are abandoned or are not being fully used because of actual or perceived environmental contamination. These properties have potential for redevelopment, but the uncertainty and risk of environmental liability and the cost of investigation and cleanup keep them from being redeveloped. Former industrial properties, abandoned gas stations, and vacant warehouses are all examples of brownfields. Redevelopment of these properties creates jobs, revitalizes neighborhoods, increases property and sales tax revenues, decreases urban sprawl, and reduces potential health risks to the local community. Infill development can also revitalize neighborhoods, increase tax revenues, and decrease urban sprawl.
- Transit-oriented development (including multi-modal transit proposals previously covered under option TLU-3) includes a shift to lower emitting mode choices by building compact development (including employment) around transit stops. Helps people meet daily needs by foot, bicycle, or transit.
- Smart growth planning, modeling, and tools includes a number of practices that allow, support, and encourage location efficient growth in communities that are proximate to household amenities (such as jobs, shopping, school, services, entertainment, etc.) as opposed to growth in areas that are not proximate and require greater travel distance and have less mode choice. Smart growth allows for mixed land uses within a project with a range of housing opportunities and multiple transportation options including pedestrian/bike access.
- Targeted open space protection includes programs designed to protect and conserve State lands and other open spaces, and develop and improve neighborhood, community, and regional parks in ways that encourage location-efficient growth and broader mode choice.

Goal levels: Target a reduction in growth in VMT from passenger vehicles of 2 to11% in the years 2007–2020 through a combined approach utilizing a number of programs that fall under those listed above.

Implementation Method(s):

Specific policy measures would include:

- Promote use of authority under Growing Smarter/Plus by counties to impose development fees consistent with municipal development fee statutes.
- Promote smart growth principles in new development by requiring bidders to include defined smart growth principles in bid packages.
- Promote use of authority under Growing Smarter/Plus by cities to create infill incentive districts and plans that could include expedited process incentives.
- Promote use by cities of a fee waiver system, similar to the Phoenix Infill Housing Program, to encourage development of single-family owner-occupied housing on vacant, orphaned, or underutilized land located in the mature portions of Arizona cities.
- Provide technical assistance to communities that want to pursue Smart Growth and disseminate lessons learned in cities such as Phoenix and Tucson.
- Provide Smart Growth information tools that identify the qualitative (e.g., improved quality of living) and quantitative benefits (e.g., reduced vehicle operation costs) of these Smart Growth communities.
- Encourage lenders to apply location-efficient mortgage principles, so transportation cost savings are recognized when calculating a household's borrowing ability.
- Encourage cities to review (and update where appropriate) their engineering plans and standards to make new road and sidewalk infrastructure more supportive of transit, bikes, and pedestrians.
- Promote and support telecommuting.[1]
- Promote and support affordable housing in new developments.
- Carefully review land swaps for potential to produce undesirable development patterns.
- Implement the vision set forth in the MoveAZ report.

Related Policies/Programs in Place:

Arizona and various counties and cities have been pursuing a variety of policies related to Smart Growth (e.g., Growing Smarter legislation and actions by Phoenix and Tucson). In addition, in 2004, the Arizona Department of Transportation completed a long-range transportation plan for the State entitled MoveAZ (www.moveaz.org). Adopted by the State Transportation Board, MoveAZ provides policy directions, performance-based evaluations of capital transportation projects, and tools for ADOT to use in planning and implementing a vibrant multi-modal transportation system for the State. If successful, these efforts will complement the other actions in the Smart Growth bundle and help it achieve VMT reductions more toward the upper range of estimates for that option.

Types(s) of GHG Benefit(s):

CO_2 reductions

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[1] There was also a suggestion of hybrid access to HOV lanes, but this will be discussed in Hybrid Incentives (TLU-, and is not part of Smart Growth.

Estimated GHG Savings and Costs Per tCO_2e:

	2010	2020	Units
GHG Emission Savings	1.47	4.0	$MMtCO_2e$
Net Present Value (2006–2020)		0 (Net savings)	$ million
Cumulative Emissions Reductions (2006–2020)		26.7	$MMtCO_2e$
Cost-Effectiveness		0 (Net savings)	$\$/tCO_2e$

Data Sources, Methods, and Assumptions:

- **Data Sources:** CCS, Arizona Greenhouse Gas Inventory and Reference Case Projections, 1990–2020, March 2006. Extensive Smart Growth literature.
- **Quantification Methods:** Modified Arizona reference cast forecast for 2008–2020 using 2–11% reduction in VMT.
- **Key Assumptions:** The value used for reduction in VMT. To be conservative, assumes "de minimus" increases in GHG emissions from increased use of alternate transit modes. Assumes that infrastructure savings offset other costs.

Key Uncertainties:

Sensitivity of VMT growth to policy shifts.

Ancillary Benefits and Costs, if applicable:

Benefits include reduced infrastructure costs, avoided health care costs from reduced air pollution and increased walking/biking, and other quality-of-life aspects. There will be front-end costs of program development and implementation for brownfields, infill, and transit-oriented development programs. A successful program requires dedicated resources to ensure that desired development is achieved. There are grants available from the EPA that assist with the initial establishment of a program or to fund environmental activities for a specific project; however, successful local and State brownfields programs have a dedicated source of funds for the program. Financial resources are required to fund staff (at least one full-time employee is typical), administrative expenses, promotion, education, etc., on an annual basis, which has averaged approximately $200,000 per year for the City of Phoenix.

Many successful programs have used financial incentives to jump-start private sector investment. As the market increasingly embraces Smart Growth, these may become less necessary. Most federal brownfields programs are not available directly to the private sector; therefore, the most effective programs nationwide provide local or state financial assistance. In the City of Phoenix, capital improvement bond funds are used to provide financial assistance directly to the private sector and to encourage the use of brownfields for public facilities. Phoenix secured $3.4 million from the 2000 Phoenix Bond Program and recently obtained $4 million from the 2006 program for brownfields redevelopment.

Feasibility Issues, if applicable:

Smart Growth developments sell at a premium.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-3 Promoting Multi-Modal Transit

Policy Description:

Arizona should promote multi-modal transit options.

Policy Design:

Arizona should enable and support shifts in passenger transportation mode choice (auto, bus, rail, bike, pedestrian, etc.) to lower emitting choices. This includes: making optimal use of CMAQ funds; expanding transit infrastructure (rail, bus, BRT); improving transit service, promoting and marketing transit (including tax-free and employer-paid commuter benefits); improving bike and pedestrian infrastructure; exploring commuter rail using existing rail corridors; considering re-establishing train service between Phoenix and Tucson; reviewing all proposed transportation projects for multi-modal flexibility (e.g., add BRT or light rail, if feasible); and conducting research into new transportation technologies and urban planning techniques.

Implementation Method(s):

Implement in concert with TLU-2, Smart Growth.

Related Policies/Programs in Place:

None cited.

Estimated GHG Savings and Costs Per tCO_2e:

Not quantified.

Data Sources, Methods, and Assumptions:

Quantified as part of TLU-2.

Key Uncertainties:

None cited.

Ancillary Benefits and Costs:

None cited.

Feasibility Issues:

None cited.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-4 Reduction of Vehicle Idling

Policy Description:

Reduce idling from diesel and gasoline heavy-duty vehicles, buses, and other vehicles through the combination of a statewide anti-idling ordinance and by promoting and expanding the use of technologies that reduce heavy-duty vehicle idling, including: automatic engine shut down/start up system controls; direct fired heaters (for providing heat only); auxiliary power units; and truck stop electrification.

Policy Design:

Currently, only Maricopa County has an anti-idling ordinance. This ordinance has not been enforced due to a lack of enforcement funding and enforcement authority. This policy would build off of the Maricopa County ordinance, strengthen it, and make it applicable statewide by the end of 2008. The statewide ordinance should be designed to be easily enforceable by the appropriate state and local agencies. It is critical that a dedicated State-funding stream for enforcement is needed for this measure to be successful in reducing vehicle idling and to obtain the predicted reductions in GHG emissions. The ordinance would also need to limit exemptions as much as possible, to make it easier to enforce. However, idling that occurs for public health and safety reasons (such as emergency vehicles) should be exempted from this rule.

This measure will also reduce idling from heavy-duty vehicles through programs aimed at increasing voluntary adoption of idle reduction technologies. ADEQ and the county agencies would collaborate on outreach and education beginning in the year 2008, to coincide with the implementation and enforcement of a statewide anti-idling ordinance. The State would also seek funding for pilot projects and demonstrations from CMAQ (Congestion Mitigation Air Quality) funds, as well as funds available through EPA, DOE, and DOT. These pilot programs could be used to evaluate the effectiveness of various idle reduction technologies prior to more widespread use throughout the State. Pilot projects could include truck stop electrification as well as an expanded school bus pilot program. The outreach materials should emphasize the benefits of reducing idling, including a reduction in fuel costs, GHG emissions, and toxic emissions.

- Goal levels: Implement a statewide vehicle idling restriction ordinance that can be enforced and that minimizes allowable exemptions, and provide the necessary resources for enforcing the ordinance. Develop and pilot the truck stop electrification programs. Target an overall reduction in idling of 80% by 2010 and 100% by 2020.
- Timing: Have ordinance in place by 2008.
- Parties: Industry, ADEQ, counties, school districts, and truck stop owners.

Implementation Method(s):

Information and education: Provide general public, trucking industry, and bus companies with information indicating when and where idling is prohibited, and under what circumstances it is permitted. Indicate the benefits of reducing idling, including fuel savings, toxic emission reductions, and GHG reductions. Provide a hotline number to call to report violations. Encourage trucking companies to do their own policing of measure. Reach out to busing companies, school districts, and truck stop owners to help bus and truck drivers be more aware of idling restrictions. Ensure that signs are also posted in venues associated with bus idling (e.g., sporting events, shows, etc.). Emphasize the fuel savings benefits, reductions in toxic emissions, and reduced engine wear associated with reducing idling.

Provide information to fleet carriers, shippers, retailers, bus companies, school districts, and others involved in the diesel fleet industry indicating the economic benefits, as well as the environmental benefits, of applying idle reduction technologies. Identify best practices within the industry and recognize companies with these best practices in place within Arizona to encourage companies to select these carriers for their shipments. Develop outreach materials with cost benefits information and toxic diesel health impacts. Outreach materials should also be geared toward making the general public aware of the GHG, toxics, and fuel-saving benefits of eliminating idling on personal vehicles, as well as on trucks and buses. Expand school bus idling program based upon the pilots currently being conducted.

Technical assistance: Coordinate with anti-idling product manufacturers to organize workshops/outreach programs to regulated communities to let them know of technological options that provide alternatives to the need for idling including products for cabin comfort, power for other functions (e.g., refrigerated trucks) and engine warm-up.

Funding mechanisms and or incentives: Propose legislation to partially fund idling technology loan grants for truck stop electrification and other idle reduction technologies in the State, focusing grants on high idling areas. Determine a dedicated funding stream that can be used to fund enforcement of anti-idling ordinance as well as for continued education and outreach. Funding the enforcing agency with an adequate share of the revenue from using the idling reduction facilities could be an option. CMAQ funds and federal money may be available for idle reduction programs. A plan needs to be developed to apply for the funds.

Voluntary and or negotiated agreements: Work with regulated entities to promote voluntary compliance assistance through distribution of materials, staff training, etc. Encourage participation in EPA's SmartWay Transport Partnership (or similar programs).

Codes and standards: Include proper language in ordinance so that the agency with enforcement responsibilities is clearly delineated and has full authority to enforce the ordinance. The language of the statewide ordinance should also make enforcement straightforward (e.g., such that any exemptions to the idling policy can be easily observed). In developing the statewide anti-idling ordinance, EPA's recent Model State Idling Law should be reviewed for potential ordinance language. For example, the EPA model rule contains the following language exempting vehicles used for emergency and public safety purposes: "A police, fire, ambulance, public safety, military, other emergency or law enforcement vehicle, or any vehicle being used in an emergency capacity, idles while in an emergency or training mode, and not for the convenience of the operator."

Pilots and demonstrations: Coordinate with product developers to help them promote their technologies. Investigate availability of funds for pilot or demonstration projects on idle reduction technologies from EPA, DOE, and DOT. If funding is available, develop a pilot program to evaluate the effectiveness of various idle reduction technologies, including implementation of truck stop electrification and expanded school bus idling program. Evaluate the effectiveness of the pilot programs before implementing on a broader scale.

Reporting: Develop a system for tracking violations so that the State can eventually determine compliance rates and benefits achieved from the ordinance.

Enforcement: Phase enforcement program to initially conduct outreach (Phase 1), provide warnings for a limited period of time (Phase 2), then issuance of tickets (Phase 3).

Related Policies/Programs in Place:

Idling restrictions are currently in place in Maricopa County. House Bill 2538, (2001 regular session) requires counties containing portions of Area A[2] to implement and enforce ordinances limiting maximum idling time for Heavy Duty Diesel Vehicles weighing over 14,000 pounds gross vehicle weight rating (GVWR). Other counties in Arizona also have the option of adopting an ordinance. The Maricopa County ordinance states "No owner or operator of a vehicle shall permit the engine of such vehicle to idle for more than five (5) consecutive minutes except as provided in Section 4 (Exemptions) of this ordinance." Violators are subject to a civil penalty of $100 for the first violation and $300 for a second or any subsequent violation, and can be enforced by any law enforcement officer on private/public property. Truck stop/distribution center owners/operators are required to erect signs indicating the maximum idling time in Maricopa County is 5 minutes. Exemptions are allowed under a number of conditions. To date, however, no violators of this ordinance have been fined. (Maricopa County Ordinance can be found at www.maricopa.gov/aq/rules/docs/fin-VIRO.pdf)

ADEQ School Bus Idling program. A number of school districts are participating with ADEQ in their School Bus Idling Pilot project. Key elements of this project include having drivers turn off buses upon reaching a school or other location and not turn on the engine until the vehicle is ready to depart; parking buses at least 100 feet from a school air intake system; and posting appropriate signage advising drivers to limit idling near the school. This program could be expanded throughout the State.

Idle reduction programs are currently being used by some shippers/carriers/retailers in Arizona. As an example, Swift Transportation is a charter member of EPA's SmartWay Transport program. This company maintains a modern fleet with an average vehicle age of less than 3 years old. Idle strategies used include optimized idle and other technologies as well as driver training.

Types(s) of GHG Benefit(s):

Reducing idling will reduce black carbon emissions, as well as all other GHG exhaust emissions (CO_2, CH_4, N_2O) through reduced fuel consumption. However, it is important to also ensure that any technologies used to reduce idling have lower emissions than the diesel truck idling emissions they are replacing.

[2] See www.azdeq.gov/environ/air/vei/images/areaa.html.

Estimated GHG Savings and Costs per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0.7	1.3	$MMtCO_2e$
Net Present Value (2006–2020)		-$258	$million
Cumulative Emissions Reductions (2006–2020)		11.8	$MMtCO_2e$
Cost-Effectiveness		-$22	$/$tCO_2e$

Data Sources, Methods, and Assumptions:

- Data Sources:

  American Transportation Research Institute, "Idle Reduction Technology: Fleet Preferences Survey," February 2006 for technology costs.

  EPA SmartWay Transportation Partnership (www.epa.gov/otaq/smartway/idlingtechnologies.htm#truck-mobile) for technology costs.

  "Analysis of Technology Options to Reduce the Fuel Consumption of Idling Trucks," ANL/ESD-43, Argonne National Laboratory, Transportation Technology R&D Center, June 2000 for information on technology impacts.

  Data from EPA's MOBILE6 model were used to estimate the proportion of CO_2 emissions attributable to Class 8 trucks.

  Data from USDOE/EIA *Annual Energy Outlook 2005* were used to estimate the amount of fuel consumed annually per truck.

  "Model State Idling Law," EPA420-S-06-001, U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Transportation and Regional Programs Division, March 2006.

- Quantification Methods: The estimated reduction in CO_2 emissions from reduced idling was calculated based on estimating the portion of emissions and fuel consumption in the Arizona inventory that were attributable to Class 8 diesel trucks, estimating the portion of the total fuel consumption that would be consumed during idling, and applying a targeted reduction of 80% to this amount starting in 2008 and a reduction of 100% starting in 2015.

- Key Assumptions:

  This analysis assumes idle reductions are achieved only by Class 8 diesel truck population; these trucks idle for an average of 6 hours per day; they consume 0.8 to 1.2 gallons of diesel per hour during idling; and that an 80 or 100% reduction of diesel idling from these Class 8 trucks is achieved.

  The cost analysis assumes a 5-year lifetime for idling technology equipment, applied to 80% of Class 8 vehicles starting in 2008 and 100% of Class 8 vehicles starting in 2015, at a cost of $6,000 per vehicle and a $2.40 per gallon diesel cost savings.

  Program administration costs, enforcement costs, fines, and reduced vehicle maintenance costs have not been factored into the cost analysis.

Key Uncertainties:

Buses, as well as other diesel trucks and gasoline vehicles and trucks that have not been quantified here, could achieve a small additional reduction in idling emissions. The distribution of technologies that would be selected by these trucks or fleets to reduce their emissions is highly uncertain. This will have a significant impact on the overall cost/cost savings of this measure. The use of these technologies will also cause a slight decrease in the CO_2 and fuel consumption reductions achieved. The use of truck stop electrification would increase emissions from electricity generation. Equipment cost and lifetime will vary by technology employed. The cost value selected was based on cost data summarized by American Transportation Research Institute, representing the capital costs of a variety of idle reduction technology. The cost of $6,000 per vehicle represents a mix of higher and lower technology costs. The cost analysis does not take into account the number of vehicles that have already installed idle reduction technologies. The fuel cost assumed here is based on long-term projected fuel costs. Increases in this assumed fuel cost will lead to greater cost savings for this measure.

Ancillary Benefits and Costs:

Reductions in idling will also reduce emissions of toxics, NOx, and PM. California estimates that 70% of toxic risk comes from diesel engines.

Idle emission reductions will reduce fuel consumption, thus leading to a cost benefit from reduced operating costs.

Additional costs are associated with on-board idle reduction technologies, but fuel savings over time typically lead to a net savings.

Providing idling reduction technologies (electrification/portable power units) at mandatory truck stops, such as Port-of-Entries/weigh stations, could prevent idling in other locations throughout the State. Providing central warehousing infrastructure may avoid idling required for refrigeration or other critical needs. Providing any new infrastructure requires funding.

Feasibility Issues:

Ability to enforce remains critical.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-5 Standards for Alternative Fuels

Policy Description:

Develop and enforce standards for ethanol, biodiesel, and other alternative fuels in order to ensure fuel quality and reduce performance problems with these fuels, and to enable more widespread acceptance of these fuels.

Policy Design:

Develop and enforce a state standard for neat biodiesel (B100), biodiesel blends, and ethanol blends. For biodiesel blends, the biofuel portion and the petroleum diesel portions of the fuel are separately regulated through American Society for Testing and Materials (ASTM) standards; however, no standard is currently in place for the blended biodiesel. Similarly, for ethanol blends, E85 and the gasoline portion of ethanol blends are regulated by ASTM standards.

Arizona currently has legislation pending that would also regulate the ethanol portion of ethanol blends. (Note: This bill was enacted by the State Legislature in April 2006.) This measure is intended to support the bill. The base gasoline for ethanol blends must meet the standards for gasoline sold in that area. Enforcement of the standard should be designed to ensure that fuel taxes are being paid and that blenders are registered with the State. To reduce fraud, the measure should ensure fuel that is delivered is as advertised, and eliminate consumer problems. Enforcement of this standard would be led by the Arizona Department of Weights and Measures. Certain exemptions might be acceptable (e.g., a school district blending biodiesel for use in its own school buses and not for outside sale).

These standards should be in place by the end of 2008. Increased funding and resources are needed for enforcement of this measure. Through the National Energy Act, growth in alternative fuels is expected in the near term. This measure will ensure that these alternative fuels sold in Arizona meet quality standards. This measure would also be broadened to include other alternative fuels that may be sold in Arizona.

- **Goal levels:** Adopt ASTM D5798-99 as the standard for E85.
  Adopt ASTM D6751 as the standard for biodiesel.
- **Timing:** Standards should be in place by the end of 2008 to encourage the use of biofuels within the State.
- **Parties:** AZDWM, ADOT, ADEQ, local jurisdictions, and school districts.

Implementation Method(s):

Information and education: Information and education will be used to disseminate information to industry and public

Codes and standards: Support the provisions of HB2590: HB2590 is the E85 bill. The current bill does several things: it adopts ASTM D5798-99 as the standards for E85; it sets standards for the equipment that will be dispensing E85 to ensure compatibility with the corrosive nature of E85; it establishes reporting requirements that will track product quality and amount of E85 produced; and it requires that the gasoline portion of the E85 must be Cleaner Burning Gasoline (CBG) in the CBG Covered Area. This is a consistent approach with how EPA deals with E85 in ReFormulated Gasoline (RFG) areas. Recommend that EVR at retail be required for E85 (or parallel to approach CARB is currently being investigated). (Note: this bill was enacted by the State Legislature in April 2006.)

Currently under A.R.S. 41-2083(K) through (N), the Department of Weights and Measures regulates the quality of biodiesel. The current law requires that biodiesel must meet the specifications in ASTM D6751 and that the diesel portion of the biodiesel must meet ASTM D975. This should help protect the consumer. Again, as in the proposed legislation, the current law requires reporting to track volumes and help ensure the quality of the product.

Enforcement: Increased funding and resources for enforcement. Currently, the Department, under A.R.S. 41-266, has the authority to enter a facility, take samples, seize evidence, and take products off the shelf if it is found not to conform to State standards. State inspectors currently inspect fueling facilities throughout the State and check fuel quality and compliance with our regulations. These powers and duties are also codified in the department rules under R20-2-104. These rules will need to be clarified to indicate where the standards will be enforced and the fines that will be levied for violations.

Related Policies/Programs in Place:

National CO_2 requirements for increased use of biofuels.

Types(s) of GHG Benefit(s):

Reduced CO_2 emissions.

Estimated GHG Savings and Costs per tCO_2e:

Not quantified.

Data Sources, Methods, and Assumptions:

Not quantified.

Key Uncertainties:

None cited.

Ancillary Benefits and Costs:

Reduced criteria pollutants, but could increase NOx.

Feasibility Issues:

None cited.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-7 Hybrid Promotion and Incentives

Policy Description:

A combination of public education and information and financial incentives to promote the sales of light-duty vehicles with hybrid gasoline-electric power trains.

Policy Design:

- **Goal levels:** An increase in the hybrid share of the light-duty vehicle fleet for the period 2007 – 2020.
- **Timing:** 2007 – 2020.
- **Parties:** Industry, ADEQ, and the Arizona Department of Revenue.

Implementation Method(s):

Hybrid promotion and incentive programs would be implemented from the years 2007 through 2020. This covers the time period between the near-term years when production is limited and the medium-to-long-term years when expansion of production capabilities makes it more likely that promotion and incentive policies will have a significant effect on consumer choices. Some promotion programs could include public education and information and partnership programs. Some incentive programs could include financial incentives such as reduction in fees and taxes for owners of newly purchased hybrid vehicles or giving preferential infrastructure access to hybrids on carpool lanes or metered parking spaces. A modest level of incentive is unlikely to spur a higher hybrid share than that likely to occur due to the State Clean Car Program (TLU-1). The State should study further the level and design of incentives necessary to achieve higher market shares for hybrids.

In the near term (2006–2008), the hybrid vehicle sales are constrained on the producer side by an inability of automobile manufacturers to keep up with already-existing consumer demand. In the medium-to-long term (2009 forward for Arizona), automobile manufacturers are likely to increase production capabilities for hybrid power train vehicles, and provide consumers with many more choices of hybrid cars. As a result, hybrid promotion and incentive programs are likely to have some incremental positive net effect on consumer purchase behavior.

Related Policies/Programs in Place:

Current law provides for a Federal income tax credit up to $3,400 for purchase of a hybrid.

Estimated GHG Savings and Costs Per tCO_2e:

Not quantified (included in TLU-1).

Data Sources, Methods, and Assumptions:

Not quantified.

Key Uncertainties:

There are numerous uncertainties about what influences consumer demand for different types of automobiles. While some consumer education and incentive programs have been shown to have positive impact (e.g., most notably, Energy Star programs), the degree of success of hybrid vehicle promotion and incentive programs is uncertain.

Ancillary Benefits and Costs:

None cited.

Feasibility Issues:

None cited.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-8 Feebates

Policy Description:

"Multi-State LDV GHG Fee and Rebate Study and Pilot Program." The State of Arizona would participate in funding a multi-state study of “feebate” program benefits and costs, including the neighboring states of California and New Mexico. Feebate proposals usually have two parts: 1) a fee on relatively high emissions/lower fuel economy vehicles; and 2) a rebate or tax credit on low emissions/higher fuel economy vehicles.

Policy Design:

The "Multi-State LDV GHG Fee and Rebate Study and Pilot Program" would consider the expected impacts of individual state feebate programs as well as coordinated or consistent multi-state programs. Ideally, such a multi-state study would include a number of western states in order to assess boundary issues as well as coordination issues. Initial analysis suggests that the Arizona new car market, which represents approximately 2% of the United States market, may be too small a share of the market to have an effect on the types of vehicles that manufacturers put into the marketplace. A consistent set of feebate programs across multiple states may include a large enough share of the U.S. market to have a more significant effect on supply side decisions made by automobile manufacturers. The study would also identify and assess the actual benefits and costs of a pilot feebate program to be implemented at the county or metropolitan level in the western United States.

Economic analyses of these proposals have found that feebate programs would work on two levels. First, the feebates would directly affect consumer choices for vehicle purchases as a result of the financial incentives. Second, the feebates could indirectly affect the types of vehicles that automobile manufacturers choose to put into the marketplace.

While feebate proposals have been described in academic studies, there has been no implementation of a full feebate program to date in the United States. While there are individual 'gas guzzler tax' and tax incentives for hybrid vehicle purchases, there is not yet any history of an on-the-ground example of an implemented feebate program.

Both the United States Department of Energy and the Canadian Transport Ministry have studied the potential impacts of national level feebate programs in recent years. While these studies have informed the debate about the advantages and disadvantages of national feebate programs, there remains considerable uncertainty about the potential benefits and costs of state or multi-state level feebate programs.

There is an important need for a greater understanding of the potential effects of single state or multi-state feebate programs on the types of vehicles that manufacturers put into the marketplace. Since existing analysis shows that 90% of the benefits of feebate programs are likely to arise from the manufacturing (supply side) response rather than the consumer (demand side) response, it is important to develop a better understanding of where the threshold for manufacturer response lies and the degree of impact of single state and multi-state programs. Some political issues also may arise relating to the potential perception of the fee portion of these programs as additional taxes on motor vehicles.

Implementation Method(s):

The State of Arizona would fund a cost-shared study with other western states. The study would be jointly funded and administered by the environment agencies and energy agencies of the states that choose to cooperate in this study.

Related Policies/Programs in Place:

None cited.

Estimated GHG Savings and Costs Per tCO_2e:

Not quantified.

Data Sources, Methods, and Assumptions:

CCS conducted a review of the most relevant research and analysis on feebate proposals. CCS made three findings:

- there has been significant conceptual development of the feebate idea, especially at the national level;
- there is a need for a greater understanding of potential benefits and costs of state level and multi-state coordinated feebate programs; and
- there has not been sufficient pilot testing of feebate programs in the United States to provide implementation experience.

CCS assessed recent studies of potential GHG emission reductions from a national feebate program based on modeling work conducted by the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL). CCS also reviewed other relevant recent studies and analyses of feebates conducted by the Canadian government, the State of California, and PIRG. The ORNL and other studies assume a national feebate rate high enough to produce responses from both consumers and manufacturers. ORNL's estimate of the national potential for reduction in carbon dioxide emissions is approximately 11 $MMtCO_2e$ in 2010 and 66 $MMtCO_2e$ in 2020.

Some attempts have recently been made to estimate the GHG emissions reduction potential from individual state feebate programs, including programs proposed for the states of Arizona and California. For example, a recent PIRG analysis suggests that a single state feebate program for Arizona would result in an estimated 0.1 $MMtCO_2e$ GHG emissions reductions in 2020. These recent estimates of the potential impacts of individual state programs are contingent upon assumptions and analytical methods that have not undergone thorough peer review. Therefore, the results of these analyses are preliminary and should be interpreted with some caution. Further analysis and study of the potential benefits and costs of individual state and multi-state feebate programs would greatly increase confidence in projected results.

Key Uncertainties:

The results of a feebate program depend on manufacturer and consumer response, which are uncertain at this time.

Ancillary Benefits and Costs, if applicable:

Feebates would reduce criteria pollutants along with GHG emissions.

Feasibility Issues, if applicable:

Requires multi-state cooperation.

Level of Group Support:

Supermajority.

Barriers to Consensus:

None cited.

TLU-9 Pay-As-You-Drive Insurance

Policy Description:

Pay-As-You-Drive (PAYD) insurance program (changing part of vehicle insurance payments from fixed charges to per-mile charges).

Policy Design:

Arizona would change insurance regulations to allow PAYD insurance, and initiate and promote an aggressive pilot of PAYD in 2008. Assuming this pilot is successful, market penetration could increase to 100% by 2020. This could happen either through competitive pressure (increasing numbers of companies offer it in order to stay competitive) or through a change in state policy mandating PAYD at some point after it has been shown to work.

Pay-as-You-Drive Insurance has been promoted by a variety of groups for reasons that include emissions reduction and safety (through decreased driving), and fairness (by changing insurance costs to more closely track the portion of individuals' risk that is created by miles driven). Some key questions and answers are presented below.

Q: Would PAYD penalize rural residents because they drive further than average?
A: Rates can be set—as most insurance rates are—for classes. PAYD rates would be charged within classes, so that a driver in that class (for example, "rural") traveling the average distance would pay the same under PAYD as before.

Q: Does the technology exist to support PAYD?
A: Yes. The necessary equipment for remote mileage readings is standard on GM OnStar-equipped vehicles. Add-on equipment to relay mileage automatically has been added in several pilot projects for several hundred dollars. All MY1996 vehicles and newer have OBD (on-board diagnostics) that already electronically monitor mileage that can be quickly downloaded via transponder. Also, current odometers are sufficiently tamper-proof to support yearly mileage readings with no additional technology.

Q: Is there any on-the-ground experience with PAYD?
A. Yes. Several companies around the world offer PAYD today. In English-speaking countries:

1) Progressive Insurance ran an initial 5,000-car pilot in Texas, which saw reductions in driving of ~20%. A subsequent pilot in Minnesota filled up its 4,800 spots quickly, and Progressive is now rolling it out in other states. https://tripsense.progressive.com/
2) GMAC Insurance and OnStar have announced a PAYD program.
3) The British insurance company Norwich Union offers PAYD in Britain. (www.norwichunion.com/pay-as-you-drive/index.htm).
4) North Central Texas Council of Governments and King County Metro (Seattle) have both recently concluded Requests for Proposals to conduct PAYD pilots (www.nctcog.org/trans/air/programs/payd/index.asp). There are no available results as yet.

Any of these pilots could be useful sources of models for an Arizona pilot project.[3] See also the discussion in the AZ Public Interest Research Group (PIRG) report, below.

Implementation Method(s):

Authorization and pilot project, followed by evaluation and promotion.

Related Policies/Programs in Place:

None cited.

Types(s) of GHG Benefit(s):

CO_2 reductions.

Estimated GHG Savings and Costs Per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0	2.8	$MMtCO_2e$
Net Present Value (2006–2020)		No net cost	$million
Cumulative Emissions Reductions (2006–2020)		12.3	$MMtCO_2e$
Cost-Effectiveness		No net cost	$/$tCO_2e$

Data Sources, Methods, and Assumptions:

CCS examined an Arizona PIRG report[4] and compared its model results for estimated reductions in vehicle miles of travel with other studies of PAYD policies, including those produced by the Economic Policy Institute and Resources for the Future (RFF). Arizona PIRG conducted an analysis of the potential GHG reductions from a PAYD automobile insurance policy. CCS found that the AZ PIRG estimates were comparable with other estimates, which ranged from 8 to 20%. As a result, the Arizona PIRG results for estimated reductions in vehicle miles of travel and greenhouse gas emissions reductions fell within the lower range of the comparable estimates. That is, the emissions reduction estimates are conservative.

AZ PIRG's analysis assumed that insurers are required to offer mileage-based insurance for certain elements of vehicle insurance, including collision and liability. AZ PIRG assumes the PAYD policy is required, phased in over time, and that all drivers in Arizona are eventually covered. (That is, AZ PIRG's analysis assumes a different path to 100% penetration than does CCS, but both assume that penetration reaches 100% by 2020.)

To calculate GHG savings, Arizona PIRG converted Arizona state automobile collision and liability insurance expenditures to an insurance cost per mile (6.4 cents per mile). Assuming insurance consumers pay 80% of their collision and liability insurance on a per-mile basis, drivers would be assessed about a 5.1-cent charge per mile. This per-mile insurance charge would reduce vehicle-miles traveled by about 8%, and light-duty vehicle carbon dioxide

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[3] For additional information see: Kevin Maney, "For a price, would you let car insurer along for the ride?", *USA Today*, 8/3/05. www.usatoday.com/money/industries/technology/maney/2005-08-03-car-monitoring_x.htm ;Todd Litman, "Pay-As-You-Drive Vehicle Insurance: Converting Vehicle Insurance Premiums Into Use-Based Charges" www.vtpi.org/tdm/tdm79.htm; Dean Baker, "Insurance By the Mile", *Harper's Magazine*, June, 2006. harpers.org/bb-insurance-by-the-mile-2838238.html ; Ian W.H. Parry, "Is Pay-As-You-Drive Insurance: a Better Way to Reduce Gasoline than Gasoline Taxes?," Resources for the Future (www.rff.org/Documents/RFF-DP-05-15.pdf), 2005.

[4] AZ Public Interest Research Group, "A Blueprint for Action," http://www.arizonapirg.org/reports/BlueprintForAction.pdf

emissions by about 4%. (See AZ PIRG, “A Blueprint for Action.”). To put this charge in context, at 20 mpg, 5.1 cents/mile = ~$1/gallon of gasoline.

Key Uncertainties:

The specifics of the PAYD insurance programs are to be determined, and the actual effects of PAYD insurance on driver behavior are subject to some significant uncertainty.

Ancillary Benefits and Costs:

Reductions in criteria air pollutants, and reductions in crashes.

Feasibility Issues:

The CCAG raised questions and potential concerns regarding disproportionate impacts on rural drivers.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-10 Low Rolling Resistance Tires

Policy Description:

Improve the fuel economy of the light-duty vehicle (LDV) fleet by setting minimum energy efficiency standards for replacement tires and requiring that greater information about Low-Rolling Resistance (LRR) replacement tires be made available to consumers at the point of sale.

Policy Design:

- **Goal levels:** Require that replacement tires be LRR tires achieving an average 3% gain in fuel economy.
- **Timing:** The requirement would begin in 2008.
- **Parties:** Industry, AZDWM, ADOT, and ADEQ.

Implementation Method(s):

Manufacturers currently use LRR tires on new vehicles, but they are not easily available to consumers as replacement tires. When installing original equipment tires, carmakers use low rolling resistance tires as a way to contribute to meeting the federal automobile fuel economy (CAFE) standards. When replacing the original tires, consumers often purchase less efficient tires. Currently, tire manufacturers and retailers are not required to provide information about the fuel efficiency of replacement tires. In addition, there is no current minimum standard for fuel efficiency that all replacement tires must meet. The rolling resistance of the various tires consumers can purchase have significant variations depending on tread design, composition, cross-section geometry, and inflation pressure.

The program would include consideration of the technical feasibility and cost of such a program, the relationship between tire fuel efficiency and tire safety, potential effects upon tire life, and impacts on the potential for tire recycling. In addition, the program would exempt certain classes of tires that sell in low volumes, including specialty and high performance tires.

An appropriate State agency would initiate a fuel efficient tire replacement program. The program could include consumer education, product labeling, and minimum standards elements. These programs would be developed under a rule development process that would incorporate the best scientific information, including the results from tests of tires conducted by the tire manufacturers, the California Energy Commission, and other data reviewed by the National Academy of Sciences.

The minimum standard is likely to be less stringent than the energy efficiency of original tires provided by the automobile manufacturers on new purchase vehicles. Such a regulation would improve the fuel efficiency of the overall LDV fleet, but not necessarily the fuel efficiency of all tires since consumers would still make choices in the marketplace. The replacement tires in the future would be on average more fuel efficient than those historically purchased, but are likely to be on average not as fuel efficient as the tires included as original equipment by the automobile manufacturers.

Related Policies/Programs in Place:

In October of 2003, California adopted the world's first fuel-efficient replacement tire law. AB 844 is a "first-of-its-kind" law requiring energy efficient tires. AB 844 directed the California Energy Commission (CEC) to develop a State Efficient Tire Program. Specifically, AB 844 requires the CEC to: 1) develop a consumer education program, 2) require that retailers provide labeling information to consumers at the point of sale, and 3) promulgate through a rule development process a minimum standard for the fuel efficiency of replacement tires sold. The California rule development process is scheduled to begin in January 2007.

Estimated GHG Reductions and Costs Per tCO_2e:

	2010	2020	Units
GHG Emission Reductions	~0	0.8	$MMtCO_2e$
Net Present Value (2006–2020)		Not quantified	$million
Cumulative Emissions Reductions (2006–2020)		4.8	$MMtCO_2e$
Cost-Effectiveness		Not quantified	$/tCO_2e$

Data Sources, Methods, and Assumptions:

- **Data Sources:** Studies by National Research Council, California Energy Commission, and Arizona PIRG.
- **Quantification Methods:** CCS evaluated and compared a series of existing assessments, as follows:

  At the request of the United States Congress, the National Research Council of the National Academy of Sciences (NRC/NAS) conducted a study of the feasibility of reducing rolling resistance in replacement tires. The 2006 NRC/NAS study made the following conclusions:

  > "Reducing the average rolling resistance of replacement tires by a magnitude of 10 percent is technically and economically feasible.
  >
  > Tires and their rolling resistance characteristics can have a meaningful effect on vehicle fuel economy and consumption.
  >
  > Although traction may be affected by modifying a tire's tread to reduce rolling resistance, the safety consequences are probably undetectable.
  >
  > Reducing the average rolling resistance of replacement tires promises fuel savings to consumers that exceed associated tire purchase costs, as long as tire wears life is not shortened."

  A 2003 study commissioned by the California Energy Commission found that about 300 million gallons of gasoline per year can be saved in that state with lower rolling resistance tires. A set of four low rolling resistance tires would cost consumers an estimated $5 to $12 more than conventional replacement tires. The efficient tires would reduce gasoline consumption by 1.5 to 4.5%, saving the typical driver $50 to $150 over the 50,000-mile life of the tires. Consumers would save more than $470 million annually at current retail prices or approximately $1.4 billion over the 3-year lifetime of a typical set of replacement tires.

The Arizona PIRG report, "A Blueprint for Action," presents estimates for potential carbon dioxide emission reductions from a low-rolling resistance replacement tire program. The AZ PIRG estimate for GHG reductions from a fuel efficient tire program is 0.7 $MMtCO_2e$ in 2020. PIRG calculates an estimated 2.4% reduction in greenhouse gas emissions from the PIRG-calculated baseline. (See AZ PIRG, "A Blueprint for Action," pp. 22-23, 54)

The PIRG analysis uses a base case scenario that is different from the approved Arizona CCAG reference case scenario. As a result, the CCS quantification method used was to apply the 2.4% estimate of the emissions reductions to the CCAG reference case scenario, producing an emissions reduction that is higher than the 0.7 $MMtCO_2e$ estimated by AZ PIRG. The resulting CCS estimate for emissions reductions from fuel-efficient replacement tires is 0.8 $MMtCO_2e$ in 2020.

- Key Assumptions: The amount of greenhouse gas emissions reductions from this policy depends upon what the average fuel efficiency of replacement tires would be under such a policy and the rate at which consumers will replace their existing tires with more fuel-efficient tires.

Key Uncertainties:

The low rolling resistance fuel efficient tires program is based upon existing off-the-shelf technologies and products that already exist in the consumer marketplace. These tires are already available in the marketplace, and are comparable with the tires included as original equipment on new purchase light-duty vehicles.

Ancillary Benefits and Costs, if applicable:

Some reduction in criteria pollutants.

Feasibility Issues, if applicable:

Some members of the group raised questions about potential safety and performance compared to conventional tires.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-11 Accelerated Replacement/Retirement of High-Emitting Diesel Fleet

Policy Description:

Reduce GHG black carbon emissions from heavy-duty diesel vehicles by developing and implementing an incentives program in Arizona to accelerate the replacement and/or retirement of the highest-emitting diesel vehicles.

Policy Design:

Starting with the 2007 model year, the emission standards for new heavy-duty diesel vehicles will be significantly tightened. In conjunction with these more stringent emission standards, the sulfur content of diesel fuel will be lowered from 500 parts per million (ppm) to 15 ppm. These measures will combine to significantly reduce GHG black carbon emissions from heavy-duty diesel trucks and buses. However, a large number of older, more-polluting diesel vehicles will remain in the fleet for a number of years. This measure is aimed at developing methods to incentivize the owners of these older vehicles to retire their vehicles early and replace them with vehicles meeting the 2007 emission standards.

- **Goal levels:** Target 25% of vehicles from model years 1990 through 2006 (e.g., vehicles that still have over 4 years of expected useful life and do not meet the 2007 emission standards) for early retirement/replacement.
- **Parties:** Industry, ADEQ, local jurisdictions, and school districts.

Implementation Method(s):

Information and education: An information and education component will be needed to provide truck and bus owners, school districts, and municipal organizations with information regarding the significant GHG black carbon emission reductions that could be achieved by retiring certain truck or bus engines with high annual emissions and replacing them with vehicles meeting the new emission standards. Provide information on potential funding partners, grants, or loans available from a number of organizations for this purpose.

Tools: Develop a database tool to show the lifetime emission reductions that would be achieved from retiring specific truck and bus models as well as calculate to estimate the cost of purchasing a new vehicle on an accelerated schedule.

Funding mechanisms or incentives: Develop policies to incentivize truck and bus owners with high annual emissions to retire their vehicles on an accelerated basis.

Voluntary and/or negotiated agreements: The program could be set up on a strictly voluntary basis.

State lead-by-example: The State of Arizona could lead-by-example by replacing their older/dirtier vehicles. Target fleet owners of older vehicles within the State for a pilot program aimed at replacing a number of that fleet's vehicles.

Related Policies/Programs in Place:

None cited.

Types(s) of GHG Benefit(s):

This program will reduce black carbon emissions.

Estimated GHG Savings and Costs Per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0.2	0.03	$MMtCO_2e$
Net Present Value (2006–2020)		Not quantified	$million
Cumulative Emissions Reductions (2006–2020)		1.2	$MMtCO_2e$
Cost-Effectiveness		Not quantified	$/$tCO_2e$

Note that reductions in 2020 are lower than reductions in 2010 due to natural fleet turnover (e.g., fewer vehicles in fleet not meeting the 2007 emission standards by 2020).

Data Sources, Methods, and Assumptions:

- **Data Sources:**

  CCS, Arizona Greenhouse Gas Inventory and Reference Case Projections, 1990–2020, March 2006.

  Data from EPA's MOBILE6.2 model were used to estimate the mix of Class 8 Heavy Duty Diesel Vehicle (HDDV) VMT, PM10 emissions, and number of vehicles by model year.

  "RIA Local Mobile Measures Methodology," EPA memo on the estimation of potential local control measures, May 2006.

- **Quantification Methods:** The 2002 PM10 and black carbon emissions estimates prepared for Arizona's greenhouse gas emissions inventory by CCS were used as the baseline emissions. These were scaled by Arizona diesel fuel use and fleet average PM10 exhaust emission rates to 2010 and 2020 to estimate 2010 and 2020 statewide PM10 emissions from Class 8 HDDVs. Data from EPA's MOBILE6.2 emission factor model were used to estimate the mix of vehicles types and ages in the fleet. The mix of model years expected to be candidates for this measure (1990 through 2006 model years) and reductions from replacing engines with new 2007 model year engines were based on EPA's assumptions by model year (EPA, 2006), providing a 90 to 98% PM reduction. PM10 exhaust emission reductions were then scaled to black carbon and CO_2 equivalent emission reductions.

- **Key Assumptions:** A replacement rate of 25% of vehicles from eligible model years.

Key Uncertainties:

Actual attainable replacement rates.

Ancillary Benefits and Costs:

This program will also reduce emissions of PM, NOx, and toxics.

Feasibility Issues:

None cited.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-12 Biodiesel Implementation

Policy Description:

Increase market penetration of biodiesel fuels in Arizona by a mixture of policies (voluntary and/or mandatory) to achieve feasible goals.

Policy Design:

Increase market penetration of biodiesel fuels in Arizona. (Ethanol reductions are accounted for in the agriculture sector.) Conduct a review of any technical impediments to biodiesel use, and, if these are not significant, proceed to policies and measures that significantly increase biodiesel use and substitution for conventional diesel fuel. Target programs to the best possible applications where they are most likely to be successful and with a certainty of obtaining significant GHG emission reductions. This measure will help to ensure that Arizona is actively pursuing and meeting or exceeding the alternative fuel penetration goals specified in the Energy Security Act of 2005.

- **Goal levels:** 75% B2 penetration by 2010 (e.g., 1.5% total penetration of biodiesel). Review the program success by 2015 and determine whether further penetration of biodiesel fuel is desirable. This review should take into consideration the interactions of biodiesel blends with the ultra-low sulfur diesel to be sold nationally by 2010 and the implementation of new diesel vehicle emission standards starting in 2007. If the program is determined to be successful at that point, and if supply of biodiesel is not an issue, set a goal of at 50% B20 penetration by 2020 (e.g., 10% total penetration of biodiesel).
- **Timing:** See above.
- **Parties:** Industry, AZDWM, ADOT, ADEQ, local jurisdictions, and school districts.

Implementation Method(s):

Information and education: An information and education component will be needed to let consumers know of product availability and associated performance issues, as well as the potential benefits of using these fuels.

Voluntary and/or negotiated agreements: A program could be set up on a voluntary basis to target certain fleet segments. For example, a B20 biodiesel program (20% biodiesel blended with 80% petroleum diesel) in a truck fleet with older vehicles (e.g., without diesel particulate filters) should achieve success. Emergency vehicles and snow removal vehicles should not be included in such programs.

Codes and standards: In order for this program to be successful, the standards and enforcement recommended under policy TLU-5 (Standards for Alternative Fuels) should be in place first. The State could impose a mandatory biodiesel use requirement for fuel vendors that goes beyond the biofuels requirement in the Energy Security Act of 2005.

Pilots and demos: Have the State of Arizona lead by example. Where practical, have State diesel vehicles begin using B10 and B20 fuel and report on experience to industry.

Related Policies/Programs in Place:

HR 6, the Energy Security Act of 2005, established a Renewable Fuel Standard that requires that 4 billion gallons of ethanol and/or biodiesel be used in 2006 nationally and increasing to at least 7.5 billion gallons in 2012.

Types(s) of GHG Benefit(s):

This measure will reduce emissions of CO_2 by 78% when compared to CO_2 emissions from diesel fuel on a full life cycle basis.

Estimated GHG Savings and Costs Per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0.10	1.1	$MMtCO_2e$
Net Present Value (2006–2020)		Zero net cost	$million
Cumulative Emissions Reductions (2006–2020)		6.2	$MMtCO_2e$
Cost-Effectiveness		Zero net cost	$/$tCO_2e$

Data Sources, Methods, and Assumptions:

- **Data Sources:**

  "Final Arizona Greenhouse Gas Inventory and Reference Case Projections 1990–2020," The Center for Climate Strategies, June 2005.

  "Documentation of Inputs to Macroeconomic Assessment of the Climate Action Team Report to the Governor and Legislature," California Climate Action Team, January 2006.

  A Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus, Sheehan et al. May 1998.

- **Quantification Methods:** The quantity of diesel fuel projected to be used in Arizona in the Arizona GHG inventory was multiplied by the penetration rate of biodiesel fuel (0.02*0.75 for 2010, 0.20*0.5 for 2020). Emission reductions from this option were quantified based on multiplying the biodiesel fuel penetration by the baseline projected CO_2 emissions and then applying a 78% reduction in CO_2 to account for the biodiesel CO_2 reduction. (Sheehan, et al, May 1998). A biodiesel fuel economy penalty of 4.6% was applied.

- **Key Assumptions:** This analysis assumes a 78% reduction in CO_2 emissions from biodiesel fuel and resolution of barriers to market penetration.

Key Uncertainties:

GHG benefits will depend on biodiesel feedstock and production process used. Benefits may differ for older trucks versus those meeting 2007 emission standards. The effect of biodiesel on engines meeting new pollution standards with low sulfur diesel is questioned by some in the industry.

Ancillary Benefits and Costs:

The use of biodiesel will also reduce emissions of PM, SO_2, CO, and HC in older vehicles (emission reduction potential reduced with new technology engines equipped with catalysts and diesel particulate filters). EPA has reported that the use of B20 biodiesel can lead to a 21% reduction in HC, 11% reduction in CO, and a 10% reduction in PM emissions. Toxic emission reductions can also be significant. However, biodiesel can lead to increased exhaust emissions of NOx and some air toxics, depending on feedstock and blend level. EPA reports a 2% increase in NOx emissions for B20 blends. Effects on newer diesel vehicles are likely to be different. An increased penetration of biofuels reduces our foreign fossil fuel dependency. Biodiesel reduces energy content which reduces fuel economy: 0.9–2.1% reduction for B20 and 4.6–10.6% reduction for B100. Biodiesel typically costs more than diesel (EPA estimates a 30 to 40 cents per gallon increase.)

Feasibility Issues:

Some members of the group were concerned that biodiesel use could lead to operational problems, particularly at low temperatures, and could also lead to operational problems on new technology engines equipped with diesel particulate filters. Others felt that these issues have been resolved and would not impact future biodiesel use.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

TLU-13 State Lead-By-Example (Procurement and SmartWay)

Policy Description:

Arizona state agencies could "lead by example" by enacting procurement policies and or joining the EPA SmartWay program that result in adoption of lower emitting vehicle fleets. There are three primary components of the program: creating partnerships, reducing all unnecessary engine idling, and increasing the efficiency and use of rail and intermodal operations.

Policy Design:

Goals, levels, timing, and participation in procurement or voluntary standards programs were not specifically considered, and need to be developed in the future.

Implementation Method(s):

There are numerous activities Arizona could pursue to participate fully in enacting procurement policies or programs such as SmartWay. For example:

State agencies with vehicle fleets could sign on as SmartWay carrier partners. They would then measure their environmental performance with the FLEET model and come up with a plan to improve that performance. The partnership provides information and suggested strategies to improve fuel economy and environmental performance of vehicle fleets.

State agencies that buy transportation services, or ship goods could sign on as SmartWay shippers. As shipper partners, state agencies would seek to select SmartWay partners when they purchased the services of carriers. One way that the State could help would be to add SmartWay certification to the list of factors that they may consider when selecting carriers. Alternatively, they could encourage the carriers that they do business with to join the partnership. Shippers can also implement direct strategies, for instance, developing no-idle policies for their loading areas.

State agencies could sign onto SmartWay as affiliates. As affiliates, they would help to distribute information on the program to interested parties. This could be as easy as putting a link on their web site, or it could involve a more active role.

Related Policies/Programs in Place:

There are three Arizona based carriers in the program now: Knight Transportation, Inc., McKelvey Trucking Company, and Swift Transportation Co.

Types(s) of GHG Benefit(s):

CO_2, black carbon.

Estimated GHG Savings and Costs Per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0.03	0.04	$MMtCO_2e$
Net Present Value (2006–2020)		Zero net cost	$million
Cumulative Emissions Reductions (2006–2020)		0.4	$MMtCO_2e$
Cost-Effectiveness		Zero net cost	$/$tCO_2e$

Data Sources, Methods, and Assumptions:

To roughly approximate what an aggressive State program could accomplish, CCS examined data on gasoline and diesel fuel use by the six largest State fleets.[5] CCS estimated the GHG reductions associated with reducing this fuel use by 85 percent. This could be accomplished by some combination of use of E85 fuels, biodiesels, ZEVs, and other alternative fuels. The analysis assumed that the 85 reduction occurred in 2010 and continued through 2020, with fleet VMT growing at the same 2.5%/year as the private LDV fleet. Similar to other options dealing with biofuels, the analysis assumed that these alternatives would be competitive in price and would result in zero net cost.

Key Uncertainties:

None cited.

Ancillary Benefits and Costs:

Some reduction in criteria pollutants.

Feasibility Issues:

None cited.

Level of Group Support:

Unanimous.

Barriers to Consensus:

None cited.

[5] Arizona Department of Administration, *Use of Alternative Fuels in the State Motor Vehicle Fleet*, June 30, 2005.

TLU-14 60 MPH Speed Limit for Commercial Trucks

Policy Description:

Reduce speed limit for commercial trucks to 60 mph.

Policy Design:

- **Goal levels:** Reduce Class 8 commercial diesel truck traffic traveling above 60 mph on interstates, freeways, and major arterials by 50%.
- **Timing:** Begin enforcement of measure by 2008.
- **Parties:** ADOT, and state police.

Implementation Method(s):

Education/outreach: Provide information to the trucking industry and the general public about the fuel economy benefits obtained when reducing speeds from 70 mph to 60 mph. Emphasize fuel savings and safety aspects.

Codes/standards: Have all interstates, freeways, and major arterials signed with a maximum speed of 60 mph for Class 8 commercial trucks. Significant enforcement resources will be needed to ensure the success of this measure.

Related Policies/Programs in Place:

Current speed limits are as high as 75 mph, depending on the highway segment.

Types(s) of GHG Benefit(s):

CO_2, black carbon

Estimated GHG Savings and Costs Per tCO_2e:

	2010	2020	Units
GHG Emission Savings	0.3	0.5	$MMtCO_2e$
Net Present Value (2006–2020)		$179	$million
Cumulative Emissions Reductions (2006–2020)		5.2	$MMtCO_2e$
Cost-Effectiveness		$35	$/tCO_2e$

Data Sources, Methods, and Assumptions:

- **Data Sources:**

  U.S. Department of Labor, Bureau of Labor Statistics, “Establishment Data; Hours and Earnings,” Table B-14 and “Employer Costs for Employee Compensation–December 2005,” Table 10.

U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Smartway Transport Partnership, "A Glance at Clean Freight Strategies: Reducing Highway Speed," EPA420-F-04-007, February 2004.

U.S. Environmental Protection Agency, Office of Transportation and Air Quality, MOBILE6 model, documented in "User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model," EPA420-R-03-010, August 2003.

Ang-Olson, Jeffrey and William Schroeer, "Energy Efficiency Strategies for Freight Trucking: Potential Impact on Fuel Use and Greenhouse Gas Emissions," *Transportation Research Record 1815*, Transportation Research Board of the National Academy of Sciences, Washington, DC, 2002.

- Quantification Methods: The diesel fuel consumption from Class 8 diesel trucks was multiplied by 80% to account for the amount of fuel estimated to be consumed at speeds above 60 mph. This fuel consumption was then multiplied by 50% to account for the expected penetration rate of this measure. This quantity was then multiplied by the percentage increase in fuel economy. The ratio of reduction in fuel consumption was then multiplied by the baseline CO_2 emissions to estimate the reduction in CO_2 from this measure. Costs were calculated by multiplying the per unit fuel cost by the number of gallons reduced and subtracting this from the product of the increased time required for traveling the same distances at 60 mph rather than 70 mph multiplied by the hourly trucking industry cost.

- Key Assumptions:

80% of Class 8 diesel truck travel (fuel consumption) is spent at speeds above 60 mph, assumed to be at 70 mph on average. Fifty percent of this truck travel is assumed to be reduced to 60 mph (Ang-Olson and Schroeer).

Each one mile per hour reduction of speed from 70 mph to 60 mph yields a fuel economy increase of 0.1 miles per gallon (EPA).

A fuel cost of $2.40/gallon is assumed.

Average hourly truck transportation wage is $17.22/hour (BLS), with an industry average overhead rate of 1.48 (BLS).

Base fuel economy assumed to be 6.42 mpg (EPA MOBILE6 model); assumed to increase to 7.42 mph with this measure.

Key Uncertainties:

The ability to enforce a speed limit significantly lower than current policy is uncertain. The fuel cost assumed here is based on long-term projected fuel costs. Increases in this assumed fuel cost will lead to lower overall costs or a cost savings for this measure.

Ancillary Benefits and Costs:

This measure will lead to a reduction in fuel consumption from Class 8 commercial trucks. Some reduction in criteria pollutant emissions would also be expected to occur. There will be an increase in travel time required for the vehicles affected by this measure. The increased costs of speed enforcement are not included here. This measure should lead to increased driver safety which may decrease operating costs. Reducing speed is also likely to reduce truck maintenance costs. These costs have not been factored into this analysis.

Feasibility Issues:

None cited.

Level of Group Support:

Supermajority.

Barriers to Consensus:

None cited.

Feasibility Issues:

None cited.

Level of Group Support:

Supermajority.

Barriers to Consensus:

None cited.